Universidad Zaragoza

Year : 2019/20

30107 - Physics II

Syllabus Information

Academic Year: 2019/20
Subject: 30107 - Physics II
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
179 - Centro Universitario de la Defensa - Zaragoza
Degree: 457 - Bachelor's Degree in Industrial Organisational Engineering
563 - Bachelor's Degree in Industrial Organisational Engineering
425 - Bachelor's Degree in Industrial Organisational Engineering
ECTS: 6.0
Year: 1
Semester: Second semester
Subject Type: Basic Education
Module: ---

1.General information

1.1.Aims of the course

This course is aiming to explore the universal nature of physical laws, their inexorable nature and the benefits that come from their knowledge in the field of engineering.

1.2.Context and importance of this course in the degree

Physics II is part of the basic training block of the degree program in Engineering Studies. It is a subject of 6 ECTS, compulsory an taught in the first year of the Degree. It provides students with background knowledge about the physical laws relevant for solving problems in engineering, in particular those related to wave motion, electrostatic, magnetism or optics. Being a subject of basic training, the knowledge and abilities acquired should serve as a basis for subjects of later courses of the degree.

1.3.Recommendations to take this course

Previous knowledge on vector field analysis and calculus is a fundamental prerequisite. Knowledge on Newton kinematics and dynamics is also required.

2.Learning goals

2.1.Competences

Generic:

1.- Ability to solve problems and take decisions with initiative, creativity and critical reasoning.

2.- Ability to continue learning and develop self-learning strategies.

Specific:

3.- Mastery of basic concepts about the principles of general mechanics, fields and waves, electromagnetism and its applicacion to solve engineering problems.

2.2.Learning goals

1.- To know the concepts and basic physical laws relevant for solving problems in engineering, in particular those related to wave motion, electrostatic, magnetism or optics.

2.- To be able to recognize the fundamental physics underlying in a technical application or real system.

3.- To know the units and orders of magnitude of the physical magnitudes and to solve the basic problems in engineering being able to present the results in the appropriate units.

4.- To properly apply the basic experimental or simulation methods and to present, analyze and interpret the obtained data being able to associate them to the appropriate physical laws.

5.- Appropriate use of bibliography, taking advantage of the currently resources and to use a clear and accurate language.

6.- To be able to recognize the underlying physics in a technical application, device or real system.

7.- To identify and experiment in practical sessions the concepts learned in the theoretical sessions.

8.-Appropriate use of bibliography in the practical works.

9.- To communicate clearly and accurately their knowledge of the subject. To know and properly apply the different basic mathematical tools to allow to establish a correct result.

10.- To solve problems associated to the contents, individually and as a part of a team, applying the theoretical concepts of the subject in practical situations.

11.- To apply adequately the concepts and basic laws of electromagnetism, wave motion and optics to the different fields of Physics and Engineering.

12.- To know the fundamentals of the magnetic and electric field and the meaning and the experimental fundamentals of the laws that describe and relate them.

13.- To know and apply the concepts related to capacitance, electrical current, magnetic induction, self-inductance and the basic electric and magnetic properties of the materials.

14.- To know the wave equation and the characteristic parameters which describe its basic solution and their energetic aspects.

2.3.Importance of learning goals

This course provides the basis of scientific and technological knowledge and application of scientific method. Therefore, the activities carried out are oriented to the development of reasoning, analysis and synthesis, problem solving capacities and introduction to lab work.

Being a basic course, the acquired competences are common with other Engineering and Architecture degrees.

Being a first year course, on the one hand it aims to consolidate school physics and on the other hand, it aims to provide a firm foundation, which should serve as a basis for technical subjects of higher courses of the degree. In particular, those related to electromagnetism, wave propagation and optics.

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

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1.-Written exam (not less than 80 % of the final mark): A midterm written exam will assess the 50 % of the theory credits. A final written exam at the end of the term will assess the 100 % of the theory credits. This final examination consist of two written exams: Part A, which features the theory contents of the midterm written exam and Part B, which features the new contents. For those students that did pass the midterm written exam, the final exam will consist of only Part B.

2.-Laboratory work (up to 20 % of the final mark): Students are required to undertake laboratory work. The practical sessions are mandatory. The sessions will take place at the Physics lab. The assessment of the practical work consists of i) a lab report including the obtained experimental results and answers to the proposed questions, and ii) a multiple choice or short answer questions or exercises in reference to the practical sessions.

To pass the subject, a mark of 5 out of 10 is needed for each of the two parts of the assessment.

A pass requires an average of 5 out of 10 or higher over the sections.

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The learning process that is designed for this subject is based on the following:

The subject consists of 6 ECTS credits, which represents 150 hours of student work on the subject during the semester. 40% of this work (60 h.) Will take place in the classroom, and the rest will be autonomous. One semester consists of 15 teaching weeks. To make the timing is used to measure the school week, in which the student must devote to the study of the subject 10 hours.

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This is a general physics course on electromagnetism and optics. It provides students with background knowledge about the physical laws relevant for solving problems in engineering, in particular, those related to wave motion, electrostatic, magnetism or optics. Previous knowledge of vector field analysis and calculus is a fundamental prerequisite. Overall, Physics II helps to develop technical skills necessary to overcome some of the subjects in higher courses like Fundamentals of Electrical Engineering and Fundamentals of Electronics.

This course provides the basis of scientific and technological knowledge and application of the scientific method. Therefore, the activities and methodology are oriented to the development of critical thinking, analysis, and synthesis. A wide range of teaching and learning tasks are implemented, such as theory sessions, laboratory sessions, and assignments.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

4.2.Learning tasks

The course includes the following learning tasks:

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- Theoretical classes: theoretical activities so fundamentally expository given by the teacher.
- Practical classes: practical discussion activities and conducting exercises conducted in the classroom and requiring high student participation.
- Laboratory Practice: Practical activities in laboratories.
- Group tutorials.
- Individual tutoring.

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This is a 6 ECTS course organized as follows:

- **Lectures.** Lecture notes and a set of problems (and their corresponding solutions) will be available for the students. At the end of each topic, some of the problems will be solved in the class by the teacher and the rest will be done individually.
- **Laboratory sessions.** Two-hour sessions that take place in the Physics Lab. Students are provided in advance with task guidelines for each session.
- **Autonomous work:** involves activities such as homework provided by the teacher, lab reports...
- **Office hours for assistance**: either individually or in small groups of students.

4.3.Syllabus

The course will address the following topics:

- I. Electrostatics field
- II. Capacity, dielectrics and electric current
- III. Magnetic field
- IV. Electromagnetic field: Maxwell's equations
- V. Wave motion
- VI. Optics

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The course will address the following topics:

1 Mechanical waves.

- 1.1 Wave equation.
- 1.2 Speed of elastic waves.
- 1.3 Properties of acoustic waves.
- 1.4 Superposition, interference and beating.
- 1.5 Doppler's effect.

2 Electrostatics.

- 2.1 Charge and electric Field (Coulomb's law).
- 2.2 Gauss's law.
- 2.3 Electric potential.
- 2.4 Electrostatics with conductors.
- 2.5 Capacitance.
- 2.6 Dielectrics.

3 Electric circuits.

- 3.1 Ohm's law.
- 3.2 Resistance and resistivity.
- 3.3 Steady-state direct current circuits with batteries and resistors only.
- 3.4 Electromotive force.
- 4 Magnetic fields.
- 4.1 Lorentz's force.
- 4.2 Biot-Savart's law.
- 4.3 Forces on current-carrying wires in magnetic fields.
- 4.4 Ampère's law.

5 Electromagnetic induction.

- 5.1 Faraday's law and Lenz's law.
- 5.2 Ampère-Maxwell's law.
- 5.3 Maxwell's equations of electromagnetism.

6 Electromagnetic waves.

- 6.1 Wave equation and properties of electromagnetic waves.
- 6.2 Poynting's vector and energy density.

7 Optics.

- 7.1 Reflection, refraction. Snell's law.
- 7.2 Optical elements.

4.4.Course planning and calendar

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Planning for weeks about the subject is as follows:

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Topic	I	I	I	I	II	II	II	II	III	III	III	IV	IV	IV	R
Exams				1º					2º					3º	

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Provisional course planning:

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Topic	1	1	1	2	2	2	2	3	4	4	5	5	6	7	R

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Moodle platform http://moodle.unizar.es

To check the school calendar and timetable visit http://cud.unizar.es/calendarios

4.5.Bibliography and recommended resources

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Resources:

Students will have the Moodle virtual platform where you will find notes, powerponit slides, corollary of exercise, laboratoy practices manuals and any other material.

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http://biblos.unizar.es/br/br_citas.php?codigo=30107&year=2019